What is claimed is:

1. An optical wavelength-multiplexing transmission system for transmitting first wavelength-multiplexing light and second wavelength-multiplexing light in opposite directions through an optical transmission medium allowing bidirectional wavelength-multiplexing transmission, wherein

a wavelength band of the first wavelength-multiplexing light is set to a shorter wavelength side as compared to a wavelength band of the second wavelength-multiplexing light, and

excitation light having a wavelength shorter than the wavelength band of the first wavelength-multiplexing light travels through the optical transmission medium in a same direction as the second wavelength-multiplexing light.

2. The optical wavelength-multiplexing transmission system according to claim 1, wherein a spacing between the wavelength of the excitation light and the wavelength band of the first wavelength-multiplexing light is determined depending on Raman scattering characteristic of the optical transmission medium.

3. The optical wavelength-multiplexing transmission system according to claim 1, wherein a wavelength bandwidth

including the first wavelength-multiplexing light and the second wavelength-multiplexing light is at least 100 nm.

4. The optical wavelength-multiplexing transmission system according to claim 1, comprising:

a first transceiver provided at one end of the optical transmission medium, for injecting the first wavelength-multiplexing light into the optical transmission medium and receiving the second wavelength-multiplexing light from the optical transmission medium; and

a second transceiver provided at the other end of the optical transmission medium, for injecting the second wavelength-multiplexing light and the excitation light to the optical transmission medium and receiving the first wavelength-multiplexing light from the optical transmission medium.

5. The optical wavelength-multiplexing transmission system according to claim 4, further comprising:

at least one wavelength-multiplexing repeater provided between the first transceiver and the second transceiver, comprising:

a first amplifier for amplifying the first wavelength-multiplexing light;

a second amplifier for amplifying the second wavelength-multiplexing light; and

an excitation light injector for injecting second excitation light into the optical transmission medium in the same direction as the excitation light injected by the second transceiver, wherein the second excitation light has a wavelength which is approximately equal to the excitation light.

6. The optical wavelength-multiplexing transmission system according to claim 1, comprising:

a first end device provided at one end of each of a first optical transmission medium and a second optical transmission medium, comprising:

a first transceiver for injecting first wavelength-multiplexing light into the first optical transmission medium and receiving second wavelength-multiplexing light from the first optical transmission medium; and

a second transceiver for injecting the second wavelength-multiplexing light and first excitation light into the second optical transmission medium and receiving the first wavelength-multiplexing light from the second optical transmission medium; and

a second end device provided at the other end of each of the first optical transmission medium and the second optical transmission medium, comprising:

a third transceiver for injecting the second wavelength-multiplexing light and second excitation light to the first optical transmission medium and receiving the first

wavelength-multiplexing light from the first optical transmission medium; and

a fourth transceiver for injecting the first wavelength-multiplexing light to the second optical transmission medium and receiving the second wavelength-multiplexing light from the second optical transmission medium.

7. The optical wavelength-multiplexing transmission system according to claim 6, further comprising:

a first wavelength-multiplexing repeater provided on a line of the first optical transmission medium, comprising:

a first amplifier for amplifying the first wavelength-multiplexing light;

a second amplifier for amplifying the second wavelength-multiplexing light; and

a first excitation light injector for injecting third excitation light into the first optical transmission medium in the same direction as the second excitation light injected by the third transceiver, wherein the third excitation light has a wavelength which is approximately equal to the second excitation light; and

a second wavelength-multiplexing repeater provided on a line of the second optical transmission medium, comprising:

a third amplifier for amplifying the first wavelength-multiplexing light;

a fourth amplifier for amplifying the second

wavelength-multiplexing light; and

a second excitation light injector for injecting fourth excitation light into the second optical transmission medium in the same direction as the first excitation light injected by the second transceiver, wherein the fourth excitation light has a wavelength which is approximately equal to the first excitation light.

8. The optical wavelength-multiplexing transmission system according to claim 1, wherein third wavelength-multiplexing light travels through the optical transmission medium in a same direction as the second wavelength-multiplexing light, wherein a wavelength band of the third wavelength-multiplexing light is set to a longer wavelength side as compared to the wavelength band of the first wavelength-multiplexing light and a shorter wavelength side as compared to the wavelength band of the second wavelength-multiplexing light.

9. The optical wavelength-multiplexing transmission system according to claim 8, wherein second excitation light travels through the optical transmission medium in the same direction as the first wavelength-multiplexing light, wherein a wavelength of the second excitation light is set to be shorter than the wavelength band of the second wavelength-multiplexing light by a same amount as a wavelength spacing between the excitation light and the first wavelength-multiplexing light.

10. The optical wavelength-multiplexing transmission system according to claim 4, wherein

the second transceiver further injects third wavelength-multiplexing light to the optical transmission medium, wherein a wavelength band of the third wavelength-multiplexing light is set to a longer wavelength side as compared to the wavelength band of the first wavelength-multiplexing light and a shorter wavelength side as compared to the wavelength band of the second wavelength-multiplexing light, and

the first transceiver receives the third wavelength-multiplexing light from the second transceiver through the optical transmission medium.

11. The optical wavelength-multiplexing transmission system according to claim 5, wherein

the second transceiver further injects third wavelength-multiplexing light to the optical transmission medium, wherein a wavelength band of the third wavelength-multiplexing light is set to a longer wavelength side as compared to the wavelength band of the first wavelength-multiplexing light and a shorter wavelength side as compared to the wavelength band of the second wavelength-multiplexing light, and

the first transceiver receives the third wavelength-multiplexing light from the second transceiver through the optical transmission medium.

12. The optical wavelength-multiplexing transmission system according to claim 1, wherein

the first wavelength-multiplexing light is included in a wavelength range from 1480 nm to 1520 nm, and

the second wavelength-multiplexing light is included in a wavelength range from 1580 nm to 1620 nm.

13. The optical wavelength-multiplexing transmission system according to claim 8, wherein

the first wavelength-multiplexing light is included in a wavelength range from 1480 nm to 1520 nm,

the second wavelength-multiplexing light is included in a wavelength range from 1580 nm to 1620 nm, and

the third wavelength-multiplexing light is included in a wavelength range from 1530 nm to 1560 nm.

14. The optical wavelength-multiplexing transmission system according to claim 10, wherein

the first wavelength-multiplexing light is included in a wavelength range from 1480 nm to 1520 nm,

the second wavelength-multiplexing light is included in a wavelength range from 1580 nm to 1620 nm, and

the third wavelength-multiplexing light is included in a wavelength range from 1530 nm to 1560 nm.

15. The optical wavelength-multiplexing transmission system according to claim 11, wherein

the first wavelength-multiplexing light is included in a wavelength range from 1480 nm to 1520 nm,

the second wavelength-multiplexing light is included in a wavelength range from 1580 nm to 1620 nm, and

the third wavelength-multiplexing light is included in a wavelength range from 1530 nm to 1560 nm.

16. An optical wavelength-multiplexing transceiver comprising:

a receiver for receiving first wavelength-multiplexing light from an optical transmission medium; and

a transmitter for injecting second wavelength-multiplexing light and excitation light to the optical transmission medium,

wherein a wavelength band of the second wavelength-multiplexing light is set to a longer wavelength side as compared to a wavelength band of the first wavelength-multiplexing light, and the excitation light has a wavelength shorter than the wavelength band of the first wavelength-multiplexing light.

17. The optical wavelength-multiplexing transceiver according to claim 16, wherein a spacing between the wavelength of the excitation light and the wavelength band of the first

wavelength-multiplexing light is determined depending on Raman scattering characteristic of the optical transmission medium.

18. The optical wavelength-multiplexing transceiver according to claim 16, wherein a wavelength bandwidth including the first wavelength-multiplexing light and the second wavelength-multiplexing light is at least 100 nm.

19. A wavelength-multiplexing repeater for use in a wavelength-multiplexing transmission system for transmitting first wavelength-multiplexing light and second wavelength-multiplexing light in opposite directions through an optical transmission medium allowing bidirectional wavelength-multiplexing transmission, comprising:

a first amplifier for amplifying the first wavelength-multiplexing light;

a second amplifier for amplifying the second wavelength-multiplexing light; and

an excitation light injector for injecting excitation light into the optical transmission medium in the same direction as the second wavelength-multiplexing light,

wherein a wavelength band of the second wavelength-multiplexing light is set to a longer wavelength side as compared to a wavelength band of the first wavelength-multiplexing light, and the excitation light has a wavelength shorter than the wavelength band of the first wavelength-

multiplexing light.

20. The wavelength-multiplexing repeater according to claim 19, wherein a spacing between the wavelength of the excitation light and the wavelength band of the first wavelength-multiplexing light is determined depending on Raman scattering characteristic of the optical transmission medium.

21. The wavelength-multiplexing repeater according to claim 19, wherein a wavelength bandwidth including the first wavelength-multiplexing light and the second wavelength-multiplexing light is at least 100 nm.

22. An optical wavelength-multiplexing method comprising the steps of:

propagating first light of a first wavelength in one direction through an optical transmission medium;

propagating second light of a second wavelength in an opposite direction to the one direction through the optical transmission medium, wherein the first wavelength is shorter than the second wavelength; and

propagating first excitation light of a first excitation light wavelength in the opposite direction through the optical transmission medium, wherein the first excitation light wavelength is shorter than the first wavelength.

23. The optical wavelength-multiplexing method according to claim 22, wherein a spacing between the first excitation light wavelength and the first wavelength is determined depending on Raman scattering characteristic of the optical transmission medium.

24. The optical wavelength-multiplexing method according to claim 22, wherein a wavelength bandwidth including the first light and the second light is at least 100 nm.

25. The optical wavelength-multiplexing method according to claim 22, further comprising the step of:

propagating third light of a third wavelength in the opposite direction through the optical transmission medium, wherein the third wavelength is longer than the first wavelength and shorter than the second wavelength.

26. The optical wavelength-multiplexing method according to claim 25, further comprising the step of:

propagating second excitation light of a second excitation light wavelength in an opposite direction to the third light through the optical transmission medium, wherein the second excitation light wavelength is shorter than the third wavelength by the approximately same amount as a wavelength spacing between the first excitation light and the first wavelength.